fourth and fifth sternites each with a conspicuous row of closely set, stiff, brown bristles, near the middle of the segment at the sides and approaching the posterior margin medially where the bristles become shorter and less regularly placed.

Length of male genital armature, 2 mm.; armature strongly asymmetrical as shown one Plate IX.

♀. Differs from the male by having a less strongly developed clypeal notch, smaller eyes, a shorter antennal club (5.3 instead of 8 as in the male), and a more convex under line of the abdomen.

Type: ♂. Halsey, Nebraska, June 1, 1912 (J. T. Zimmer).

Allotype: ♀. Holt County, Nebraska.

Paratypes: 6 ♂, 1 ♀.

Nebraska, Halsey 4 ♂; Holt County 2 ♂.

Kansas, Mendora 1 ♀.

Ochrosoma is one of the more easily recognizable species of *Serica* because of its unusually pallid color, shining surface, deep and obtuse clypeal incisure, strongly reflexed anterior margin of clypeus, conspicuous abdominal bristles and distinctive structure of the male genital armature.

INSECTS OF THE SWAMP ROSE-MALLOW, HIBISCUS MOSCHEUTOS L., IN NEW JERSEY.

By Harry B. Weiss and Edgar L. Dickerson,

New Brunswick, N. J.

In 1907 when the writers were observing the buprestid beetle *Rhæboscelis tenuis* Lec., on the swamp rose-mallow (*Hibiscus moscheutos*) growing in a nursery, they noted other insects infesting this plant and it appeared to them that observations on these insects might prove interesting. Accordingly, a study of the insects associated with this plant was undertaken. Some of the observations were made in 1917, but the major portion during the season of 1918. The results are given in this paper and it might be added that they were carried on incidental to other work and were made on plants in some of the nurseries as well as those growing on the marshes in their natural environment.

The plants and the insects associated with them were observed at several places in New Jersey, but the principal observations were made at Arlington and in a nursery at Rutherford. It must be understood that the dates given apply to the latitude of New Jersey and would probably be somewhat different for the same species at points further south.

The swamp rose-mallow is a perennial herb growing from three to six feet or more in height and forming a number of erect, cane-like stems at the summits of which are borne the conspicuous flowers on stout pedicels. The flowers vary from four to seven inches across, are white or pink, sometimes with a crimson center and form a conspicuous feature of the marsh inhabited by these plants when in bloom from late July to early September. "Only one style of flower occurs on any given plant, but the plants are usually mixed together indiscriminately and show besides differently colored flowers, considerable difference in the shape of the leaves, pods and calyx lobes. Dr. N. L. Britton has described as distinct *H. oculiroseus* (cf. Jour. N. Y. Bot. Gar., IV, 220, 1903) from a plant of the crimson eye, cultivated and introduced into the nursery trade by Mr. William Bassett of Hammonton, N. J., from an original plant obtained at Absecon, N. J. The wild plants now growing there, however, are normal *H. moscheutos* and I regard Dr. Britton's species as a sport due to cultivation" (Witmer Stone, Plants of Southern New Jersey, N. J. State Mus. Rept., 1911).

The conspicuous flower is followed by a fruit in the form of a 5-valved, green capsule almost an inch in diameter, ovoid and more or less acuminate at apex. This contains a number of round or reniform brown seeds, which fall or are shaken out after the capsule splits open in October. The swamp rose-mallow occurs along the Atlantic Seaboard from Massachusetts to Florida chiefly in the brackish marshes, but also to some extent in marshes bordering fresh water ponds and streams. In New Jersey this species is found in numerous places along the coast and Delaware River. It occurs at several inland points as well, such as Lawrence Station (Mercer County) and Rahway (Union County), while the most northern points recorded are near Closter (Bergen County) and Hopewell (Hunterdon County). Frequently it is found growing among cattails. An interesting feature of this plant is that while its natural

habitat is the swamp or marsh it appears to thrive just as well in the normal soil found in the nurseries where it has been noted to vary considerably, in some instances producing flowers of a very large size.

Rhæboscelis tenuis Lec.

Rhæboscelis tenuis Lec., was described by Le Conte in 1863 in the Smithsonian Miscellaneous Contributions, from specimens collected by Mr. Ulke in Maryland and by Mr. Benj. D. Walsh in Illinois. Since then it has been recorded in very few local lists and so far as we are aware there has been very little or no indication of its habits or food plant. In Ulke's Washington list it is recorded as being taken on oak, but a more nearly accurate suggestion is made in Smith's List of the Insects of New Jersey (1909), where Mr. Wenzel records it from Anglesea in July on low plants in swampy glades.

Our attention was first attracted to this insect early in the summer of 1917 when it was observed in the Bobbink and Atkins nursery at Rutherford feeding on the leaves of the swamp rose-mallow. It was apparent that this was the food plant of the adult and perhaps that of the larva as well and further investigations later in the season proved this surmise to be correct.

The adults make their appearance about the middle of May and continue in evidence until the latter part of July. By early August they have disappeared. The eggs of this species have not been observed, but it is evident from a study of the larval burrows that the eggs are deposited in the upper part of the stems or even in the leaf petioles, probably inserted into the bark tissue. From each egg there develops an agrilid-like larva save perhaps that it is somewhat more elongate as will be noted in the description which follows. This larva burrows down the stem into the pith or between the pith and wood, making a characteristic winding or zig-zag gallery. In some cases it appeared that the larvæ retraced and burrowed up the stem again as pupal chambers in some cases were found pretty well up the stem, too high for the larva to have reached the point by simply burrowing downward and not enough distance having been covered for the larva to have reached its full development.

There is no external evidence on the stem to show the presence of the larva within, but where burrowing occurs in the leaf petiole

as was the case with some found early in the summer of 1917, the petioles either become shrivelled or decidedly swollen and cracked. In these cases the eggs had evidently been deposited at the base of the leaf blade. In 1917, on August 1, larvæ were found in leaf petioles, so that apparently only a few days previous to this had they hatched from the eggs and it seems probable that larval development begins in July. From this date on they may be found at various times during the season. By the approach of cold weather in the fall larval development is completed and the lava assumes a characteristic position in a pupal chamber. These larval cells or pupal chambers may be located either in the pith or woody portion of the stem, but not at the surface and usually at an angle. They have been found at the base of the stem, even slightly below the ground surface, but never at the tips.

In these burrows the larva hibernates with the body doubled over on itself, the folding taking place between the third and fourth abdominal segments, sometimes with the head pointing upward and sometimes in the reverse position. This condition continues until the following April or even early May, as pupæ were found in stems this year (1918) when examined on May 25.

The pupal stage apparently is of about two weeks' duration. Infested stems examined on April 22 were found to contain larvæ, and from these adults emerged May 8. In emerging it is evident that the beetles eat their way out from the pupal chamber. The adults frequent the upper surface of the leaves of the food plant and in the nursery at Rutherford, where most of the observations were made, many were noted in that location at various times during the season, both in copulation and feeding. They feed on the younger leaves, making holes from one sixteenth to one eighth of an inch in diameter. These holes apparently become intensified as the leaves enlarge, and on a badly infested plant many leaves may be injured in this way. The attitude of the beetles varies with weather conditions. When the sky is overcast they may be readily picked from the leaves, but on a bright day when capture is attempted, they release their hold and drop, usually catching on one of the lower leaves or spreading their wings in attempted flight.

The descriptions of the various stages are as follows:

Egg.—Not observed.

Larva.—Length 12 to 13 mm. Width of thorax 1.1 mm. Long, narrow, cylindrical, white or slightly yellowish except head; composed of 13 segments. Head triangular, obtusely rounded anteriorly somewhat retracted into first segment; ventral surface dark brown, dorsal surface lighter, becoming more so posteriorly. Thoracic segments subequal, sides strongly arcuate; anterior margin of first thoracic segment protruding so as to cover most of head. Fine, dark, impressed, median line on dorsal and ventral surfaces of first thoracic segments beginning at posterior margin and extending anteriorly beyond the middle of the segment. Abdomen subcylindrical, slightly flattened dorso-ventrally, sides of segments subparallel, slightly arcuate, impressed at joints. First abdominal segment subquadrate, remaining ones slightly increasing in length toward posterior end. Ultimate segment triangular, distal end obtusely rounded and slightly dark at margins. Stigmata on second thoracic and abdominal segments one to eight.

Pupa.—Length 6.5 mm. (Pupal cell, length 7–8 mm., width 1–1.6 mm.) Long, cylindrical, broadest at thorax. Head narrower than thorax and slightly bent ventrally. Antennæ extending posteriorly to middle of first thoracic segment. Sides of thorax and anterior portion of abdomen subparallel. Posterior half of abdomen gradually tapering to tip. Posterior abdominal joints slightly ridged. Wing pads extending to middle of abdomen.

Adult.—Rhœboscelis tenuis. The following is the original description by Le Conte (New Species of N. Amer. Col., 1863, part I, p. 82, Smithsonian Misc. Contrib.): "Valde elongata, nigro-aenea, griseo-tincta, capite convexo, haud dense punctata, profunde canaliculato, thorace latitudine paulo breviore, antice sublatiore et lateribus ibi rotundatis, haud dense rugose punctato versus latera oblique excavata, angulis posticis rectis planis, elytris rugose punctata, apice singulatim rotundatis haud serrulatis; unguiculis appendiculatis. Long 20." Le Conte states that it closely resembles *Agrilus egenus* or any other of our smaller species, but is known at once by the antennæ being scarcely longer than the head and received in well defined but short grooves excavated in the inflexed portions of the prothorax just beneath the lateral margin.

As has been stated, the rose mallow is confined largely to the Atlantic seaboard and it is evident therefore that if this is the only

food plant of this species, it would follow the same distribution. In regard to this matter, Mr. Leng on inquiry has written as follows: "*Rhœboscelis tenuis* is recorded from New Jersey, District of Columbia and Florida. A closely allied species has been described by Schaeffer (Jour. N. Y. Ent. Soc., XII, p. 211) from Texas. It is not mentioned in Blanchard's New England List nor in Hamilton's Pennsylvania List nor in the Michigan List nor is it mentioned by Blatchley, so that its distribution so far as I know seems to be restricted to the more southerly Atlantic States and possibly the Gulf States. In Ulke's list it is said to have been taken on oak, but the reference given in Smith's List shows that it occurs from May to September on low plants in swampy places."

The latter date is a record from Lakehurst and seems rather difficult to account for, as it hardly seems possible that the life history would be so very different at Lakehurst from what it is at Rutherford where the adults apparently disappeared by mid-summer. The local records of distribution are as follows: Rutherford (nursery); Arlington (meadows); Springfield (nursery); Palmyra (river marsh); Lawrence Station (pond shore); Westville (river marsh); Gibbstown; Greenwood Lake, v, 17 (Joutell); Lakehurst, v, vi, ix (Joutell); Gloucester, vii, I (Boerner); Five Mile Beach, April 4 (Wenzel); Burlington Co., June 4 (G. M. Greene); NEW JERSEY. Dyker Meadows, L. I., vii, 6 (Shoemaker); Belleport, L. I., vi, 27 (Nicolay); NEW YORK. Angora, June 15 (G. M. Greene); PENNSYLVANIA. Chesapeake Beach, vi (Shoemaker); MARYLAND.

In the nurseries where the last season's dry stalks are allowed to remain on the plants, the beetles emerging from these infest the present season's growth. Moreover, it is apparent that if these old stalks are cut and burned, the infestation will be largely eliminated. If this is done the stalks should be cut at the surface of the ground. The importance of this was shown in a nursery where the stalks had been removed in the early spring, but several inches at the base had been left standing, and in these mature larvæ and pupæ were found. It is also evident that the injury to the leaves by the adults could be controlled by spraying with arsenate of lead.

Conotrachelus fissunguis Lec.

The description of this species by LeConte appeared in 1876 in the Proc. Am. Phil. Soc., XV. Blatchley and Leng in their "Rhyn-

chophora or Weevils of N. E. America" state that it ranges from New Jersey and the District of Columbia to Louisiana, breeding in the seed pods of the swamp rose-mallow (*Hibiscus moscheutos* L.), occurring in New Jersey from July to October. Smith in his 'Insects of New Jersey" (N. J. State Mus. Rept., 1909) says that it is found along the river front near Camden and everywhere along shore in mallow swamps.

The beetles appear in July and by the last week in August, most of the eggs have been laid and only a few adults are to be found. At Westville, N. J., on August 23, only several adults were taken in the flowers while feeding on the bases of the petals and these were evidently stragglers. At this date egg-laying was practically over, as a dissection of the seed capsules showed a few unhatched eggs, many small-sized larvæ and a few full-grown ones.

The egg punctures consist of irregular circular openings through the seed capsule wall, each being about 1 mm. in diameter. They are readily identified by the blackish color around the edges of the openings. The whitish eggs are found resting against the inside wall of the seed capsule, near the puncture or between the developing seeds near the puncture. Some seed capsules contained as many as eighteen punctures, while others had as few as two or three.

Upon hatching the young larva goes in a developing seed to feed and hollows it out, leaving only the outer shell, which soon decays and turns black. This operation continues until the larva is too large to enter a seed and then the seeds are consumed from the outside. When full grown the larva leaves the seed capsule either by cutting a circular hole in it or by simply crawling out if the capsule has split open as it naturally does.

It then drops to the ground and works its way beneath the surface to a depth of one half to one inch, where it constructs a little cell in which to pupate. In the laboratory larvæ under our observation entered the soil on August 27 and became pupæ on September 2. On September 17 the pupæ turned brownish and on the 18th they had transformed to beetles, showing that sixteen days were required for pupation. After the pupal skin is shed the adults are whitish and without distinct marks. They remain in the cell several days until the colors are fully developed. On September 22 and for several days later they emerged from the soil.

The adults collected in the field during the latter part of September and October are probably members of a new brood which later go into hibernation. In the field we found infested seed capsules only on those plants growing along the edges of the marsh. None was observed on plants growing on the marsh. The reason for this is evident when one considers that pupation would not take place successfully in almost constantly wet ground.

Egg.—Length 1 mm. Width 0.38 mm. Oval, color white with very slight tinge, chorion smooth.

Full Grown Larva.—Length 8.5 mm. Width of head 1.1 mm. Normal curculio-form type, resting in characteristic curved position. Color yellowish white; skin smooth, transversely wrinkled; apodous; largest at central portion and tapering slightly toward head and somewhat more so toward oval end where it is obtusely rounded. Head yellowish white in young and partly grown larva and reddish brown in mature larva with mandibles and adjacent sutures darker. Dorsal surface of first thoracic segment reddish brown divided by a median light line. Each segment bears a transverse row of eight fine hairs consisting of four subventral and four subdorsal ones. Double row of hairs on first thoracic segment and several hairs on head. Spiracles on all segments except second and third thoracic and last abdominal.

Pupa.—Length 5.5 mm. Width 4.4 mm. Similar in color to larva. Dorsal surface well supplied with spines, fewer on ventral surface.

Adult.—*Conotrachelus fissunguis* Lec. (from Blatchley & Leng). "Broadly oval, robust, convex. Dark brown; elytra in great part densely clothed with short yellow pubescence, darker near apex, a short denuded blackish band crossing the suture about the middle; femora annulated with yellow pubescence; antennæ, tibiæ and tarsi paler. Thorax as long as wide, sides slightly rounded, feebly constricted near apex; disc very coarsely and deeply punctured and with longitudinal ridges near the tip, the middle one more distant. Elytra at base one half wider than thorax, sides parallel, then obliquely narrowed to apex; disc with rows of large distant punctures; intervals wide, flat. Abdomen coarsely punctured. Length 5–5.5 mm."

In addition to the distribution mentioned above, specimens in collection at the New Jersey Agricultural Experiment Station show that

the species occurs at Mt. Airy, Pa., and in New Jersey at Woodbury VII and VIII; Anglesea VIII, IX and South Camden. Up to the present, we have found this insect only on plants in the South Jersey marshes and not in the nurseries. Consequently no control methods need be considered. Once in a nursery, however, considerable damage could be done by this species if the plants were being grown for seed purposes as each capsule contains approximately 100 seeds and three or four larvæ will destroy nearly all of them.

It was noted that the adults of *Conotrachelus fissunguis* made a slight wheezing sound. This was quite audible when five or six were placed together. It was also observed that the noise accompanied vertical movements of the tip of the abdomen. An examination of the beetle showed that the dorsal surface of the end of the abdomen was covered with a chitinous plate which was supplied with numerous closed-fan-shaped spines. An examination of the ventral surface of the wing covers showed a somewhat horizontal series of short ridges near and somewhat parallel to outer posterior edges. Inasmuch as our supply of living specimens was limited and as they died before we could complete our observations we are not entirely convinced that these structures are responsible for the sounds produced.

Apion hibisci Fall.

Numerous galls of this species were first noted at Arlington, N. J., on plants growing at the edge of a drained marsh and later at Rutherford on nursery plants. Specimens of the beetles were recently sent to Prof. H. C. Fall who stated that it was a new species and kindly described it as *Apion hibisci,* so that it could be properly referred to in this paper.

The adults appear during the last week of August and the first two weeks of September. They evidently go into hibernation quarters soon after emergence because none could be found in the vicinity of the empty galls. They reappear during the following spring and deposit eggs in the bases of the leaf petioles. By the first week in July the galls are quite prominent and during the first two weeks in August pupation takes place, the adults appearing as previously stated.

Normally, the gall consists of a somewhat globular swelling of the base of the leaf petiole, but the galls are not at all uniform. In

many cases the swollen parts include in addition to the gall proper, a portion of the surface of the stem below the petiole base and the entire petiole and even the bases of the main leaf veins. The infested parts of the plant are therefore quite irregular in outline. It was noted that the galls did not occur below one and a half or two feet from the ground, showing that the plant had made some growth before oviposition had taken place. In some cases nothing was noted in the galls, although this could not be due to the fact that oviposition had been too recent. In most cases each gall inhabited contained one larva, but two were not infrequent. In rare cases three were found. Where two larvæ occurred, it appeared from the injury that oviposition had taken place on both sides of the petiole. In other cases, where only a single larva was found, it seemed as if development had not taken place in the unoccupied side of the gall.

It was observed that the first adults emerged from galls nearest the ground, that further up the steam, including the middle portion, the galls contained pupæ, and as the tip was approached, larvæ were found. From this it would appear that the first eggs were deposited in the lower leaf petioles. It might also be noted that there were sometimes two groupings of galls, several near together, then no galls for a short distance, then more further up the stem.

The globular portion of the gall, which is at the base of the petiole, contains the larvæ and it appears that they bore in the thickened bark tissue. In a few instances they continue down the stem of the plant or out into the leaf petiole, but such injuries are infrequent. The number of galls on a single plant varied from one to fifteen, the average being about eight or ten. The number of blank galls on a stem varied from three to twelve.

Egg.—0.35 mm. in diameter, globular, translucent.

Full Grown Larva.—Length 3 to 3.7 mm. Width of head 0.4 mm. Characteristic curculio-form resting in normal curved position, slightly flattened laterally, skin transversely wrinkled. Apodous. Color yellowish white. Entire surface pilose. Body broadest through middle abdominal segments tapering rather abruptly at anal end. Anal extremity obtusely pointed. Thoracic portion tapering slightly toward anterior end. Outer ventral portions of thoracic segments distinctly rounded. Head smaller than thoracic segments and slightly darker than body. Decided constriction between head and thorax.

Pupa.—Length 2.6 to 3 mm. Color light yellowish white. Shape broadly elliptical, tapering to oval end which is obtusely pointed and which bears a pair of spines each terminated by a pair of minute, recurved hooks. Head reflexed, snout extending to middle portion of body and bearing at middle a pair of minute hairs (one on either side). On front margin of prothorax are a pair of minute tuberculate spines, on either side of the middle of the pronotum, a tuberculate spine posterior to each of the above pairs and a pair of minute tuberculate spines on either side of the middle along the posterior margin. A single, dorsal, tuberculate spine on mesonotum. Dorsal abdominal surface more or less tuberculate, bearing minute short spines. A single, tuberculate spine occurs near distal end of femur of middle and hind leg.

Adult.—Apion hibisci. The description by Fall appeared in a recent number of this Journal (Vol. XXVI, p. 219) in his paper on "New North American Species of Apion," and need not be repeated here. According to Prof. Fall, *hibisci* belongs to Section IV of his Synopsis (Trans. Am. Ent. Soc., 1898), and would by the table fall near *attenuatum,* after which it may best be placed; differing by its stouter form, broader thorax, more parallel elytra, more basally inserted antennæ, and paler tibiæ and tarsi. The sexual differences are very feeble, consisting only in the slightly longer beak in the female.

The presence of numerous galls on a plant resulting in the petioles being swollen and the stem deformed and misshapen disfigures it greatly and interferes with a normal growth although no dead plants were observed as a result of such infestation. Infested plants had normal foliage and appeared to flower as well as those which were not infested. Should this insect prove injurious in a nursery or garden, cutting and burning infested stems before the beetles emerge is suggested as a method of control.

Bruchus hibisci Oliv.

This species was described by Olivier in 1795 (Ent., IV). According to Blatchley (Coleoptera of Indiana) it is common in the southern two thirds of Indiana occurring from April 13 to November 1, breeding in the seeds of rose-mallow and during the spring and summer frequenting the flowers of red-bud, dogwood, red haw, etc.

All of the records in Smith's List are from the southern part of New Jersey and the dates of captures indicate that it can be found from May to September. Mr. W. T. Davis writes that he has specimens from Staten Island dated September 3 and Mr. Frost a specimen from Lexington, Texas, dated July.

From the middle of August until the middle of September we found beetles inhabiting the flowers of hibiscus in nurseries and marshes in South Jersey, feeding on the pollen. Very often they were found between the calyx and corolla and when disturbed many of them would enter this place for the purpose of concealment.

Eggs were noted during the last of August and the first week or two in September. These are laid on their sides on the outside of the green seed capsule, usually in irregularities or depressions on the surface. Some were found in the depressions running from the base to the apex of the seed capsule, which marked off the capsule chambers, while others rested close to the base of the seed capsule near the calyx.

After hatching, the young larvæ appear to enter the seed capsule at its base close to the calyx. Some bore through the calyx near the base of the capsule for a short distance before entering the capsule. Several larvæ were found in such situations on August 28, while others were noted inside the capsule near the base. Once inside they enter the developing seed and complete their larval existence. Pupation also takes place in the seeds, which appear to ripen the same as uninfested ones, no evidences of infestation being visible externally.

The beetles begin to emerge during the latter part of September and continue throughout October in the southern part of the State. By the time the beetles have developed the capsules have opened, exposing the seeds, so that the insects do not have to bore through the capsule to escape. At one nursery in South Jersey we were informed that beetles usually emerged in November from seeds gathered during the last of October and kept in a warm storage room. Mr. W. T. Davis has obtained beetles from seeds collected during November, and Blatchley states that they emerged from October 15 to November 1 from seeds kept in vials. After emergence, they undoubtedly go into hibernation.

Egg.—Length 0.51 mm. Width 0.14 mm. Opaque, elliptical, broadly rounded at both ends, somewhat flattened on side, which rests

against seed capsule. A female collected August 28 and dissected showed ten developed and twenty developing eggs. The recently hatched larva is about 0.35 mm. long and the width of the head is 0.09 mm. While we had thousands of hibiscus seeds at our disposal, the infestation was so light that we were unsuccessful in locating either full-grown larvæ or pupæ. Hundreds were broken up in the attempt, but nothing resulted. No external marks of infestation were visible and infested seeds did not respond to the tests usually recommended as a means of discovering infestation.

Adult.—Bruchus hibisci Oliv. The following redescription is by Blatchley: "Broadly oval, robust. Black, moderately shining; sparsely pubescent with grayish-yellow hairs which on the elytra are frequently and irregularly interrupted by transverse bare spaces; antennæ pale reddish brown, joints 4–9 often slightly darker; front and middle legs rufous; hind femora black, red at tip. Thorax twice broader at base than long, rapidly narrowing to apex; surface sparsely punctured. Scutellum whitish, bifid at tip, median line distinct. Elytra together as broad as long, disc convex, finely striate, the striæ punctured; intervals flat, marked with fine and coarse punctures intermingled. Pygidium black, broadly oval, sparsely punctured. Length 2–2.5 mm."

Records.—Woodbury (Li); Westville, V–VIII (div.), VI–16 (G. M. Greene); Clementon VI; Big Timber Creek, VIII (G. M. G.); Anglesea, V, 28–IX, 20 (div.); Riverton, VIII, 12 (Weiss and Dickerson); Palmyra, VIII–12 (Weiss and Dickerson), Sept. 5 (Weiss and Dickerson); Eatontown, VIII–28 (Weiss and Dickerson); Lawrence Station, VIII, 19 (Weiss and Dickerson); Eatontown, VIII, 28 (Weiss and Dickerson); Atlantic Highlands, VIII, 15 (Weiss and Dickerson); Westville, VIII, 23 (Weiss and Dickerson); New Jersey. Staten Island, September 3 (Davis); New York. Mr. Leng writes that it is known also from the District of Columbia and Michigan. Blatchley's Indiana and Frost's Texas records have already been noted.

The entire interior of the seeds is destroyed by the larvæ and nothing but the hard outer shell remains. The beetles emerge through almost circular openings varying from 1.25 to 1.5 mm. in diameter. Up to the present, this insect has not been numerous enough on commercial establishments to make control measures necessary. At one

place it was customary to place camphor balls in with the seed after it has been collected and stored, it being believed that this prevented further infestation. We have no evidence, however, for assuming that the beetles reinfest stored seed. If they do, keeping the seeds in a cool temperature would prevent development.

Chætocnema quadricollis Schwarz.

This species was first noted by us during the summer of 1916 at Arlington, N. J., where it was very abundant on the foliage of hibiscus in a nursery. Numerous specimens were recently submitted to Mr. C. W. Leng, who after an examination of them, very kindly supplied us with the following note:

"This species is described by Dr. Horn (Trans. Am. Ent. Soc., XVI, 1889, p. 267) as having the head impunctate, piceous black with faint æneous luster, antennæ entirely rufotestaceous. In the series collected at Rutherford, N. J., on rose-mallow by Weiss and Dickerson, the head like the pronotum has feebly impressed punctures, as well as the microscopic punctulation that causes the surface called alutaceous by Horn, but they are more distant and hardly apparent except at sides. Florida specimens collected by Mr. Schwarz also show a very few such punctures; and the Horn description requires modification. The color in the New Jersey specimens varies, many having not a faint but a very decided ænous luster; the last joint of the antennæ is often fuscous and the hind femora instead of being sometimes slightly darker are usually decidedly piceous externally.

"In the original description by Schwarz (Proc. Am. Phil. Soc., xvii, 1878, p. 368) the color is given as æneous above head and thorax brassy, antennæ and legs bright testaceous red, hind femora more or less infuscate. The head is described as having a few scattered punctures. Dr. Horn's description, therefore, departs from the original as well as from the facts. The New Jersey specimens seem on the whole slightly different to the Florida ones, but not sufficiently so as to require a name."

Since 1916 we have found this flea beetle to be present at the following localities in New Jersey: Hammonton, July 8; Rutherford, June, July 13, Sept. 15; Eatontown, Aug. 28; Ridgefield, July 22; South Orange, Aug. 3; Westville, Aug. 23; South Amboy, Aug. 17, and Little Silver, August, occurring on plants growing on the marsh

as well as in the nurseries. Mr. H. S. Barber writes that he has found this species on hibiscus in the marshes of Chesapeake Bay and near Washington, D. C.

The beetles infest both leaf surfaces, preferably the upper, their feeding being quite characteristic and often resulting in a complete killing of the foliage. As a rule they feed in colonies of from five or less to fifteen or more individuals and are present during June, July, August and September, being most numerous during June and July.

Adults were observed in copulation on July 13 and August 28. The egg from a dissected female is elliptical, white and rounded at both ends. No measures of control have been worked out, but if necessary the use of Bordeaux mixture and arsenate of lead is suggested as a repellent.

Gelechia hibiscella Busck.

This species, which was kindly identified by Mr. Carl Heinrich through the courtesy of Dr. L. O. Howard, was under our observation for the past two years. It was described by Busck in 1903 (Proc. U. S. Nat. Mus., vol. 25, p. 869) from specimens collected and reared from larvæ on hibiscus in the District of Columbia. In Smith's List (N. J. State Mus. Rept., 1909) it is recorded as rare from Anglesea. As a matter of fact, we have found it fairly plentiful in several widely separated places in New Jersey.

According to Busck, whose observations were made in the District of Columbia, the larva feeds on the leaves or in the seed capsules, generally in large numbers together. When ready to pupate they partially bite off one or more leaves which thus dry up and crumple and afford convenient shelter; or others find room in the dried fruit or between it and the large surrounding calyx. The species overwinters as larvæ and two generations are found, the adults issuing from hibernating larvæ in May and from the summer brood in August.

In New Jersey from observations conducted on plants in a nursery at Rutherford and on a marsh at Arlington, it is evident that there are two broods. Adults appear from overwintering larvæ during the first two weeks of June and deposit eggs on either the under or upper leaf surface, usually near the tip or margin. These hatch in about one week and the larvæ feed on the leaves and some-

times on the tender tissue of the stem. During the last few days of July and the first three weeks of August, adults appear and eggs are again deposited. Most of these hatch by the last of August and by the middle and last of October the larvæ are full grown and have sought hibernation quarters. In addition to feeding on the foliage the larvæ also roll the leaves from the edge toward midrib. Usually one side only was rolled, but sometimes both. In a very few cases the leaves were rolled from the tip downward toward the middle.

As a rule the method of procedure was as follows: The larva resting on the blade of the leaf would crawl out on the petiole for about one quarter of an inch from the base and bite through the petiole until the leaf hung only by a few strands of tissue. This caused the leaf to wilt gradually, making it more flexible and easier to roll. The larva then would roll the leaf from the outside, fastening it with several strands of silk. Inside these rolled leaves, which later became very dry and brittle, were found larvæ in all stages and pupæ. The curled leaves finally drop to the ground and on several occasions pupæ were found in them.

Pupation evidently takes place in the curled leaves either on the plant or on the soil. According to Busck, the cut leaf dries up and crumples, but in New Jersey, however, we found that they were rolled and fastened by the larvæ. The larvæ are very active when disturbed in their shelters and elsewhere and wriggle violently in their efforts to escape. The second brood of larvæ confine their feeding mostly to the young leaves, the stem tissue near the tip, and the base and surroundings of the seed capsule. On October 24 at Rutherford, partly developed and full-grown larvæ were observed in the dried seed capsules. Some had eaten their way into the base of the capsule inside the calyx. Some were found in the bottom of the capsule in one of the four divisions, together with partly eaten seeds. Others were found under the somewhat dried stem tissue at the tip of a shoot. In every case, the material around the larva was somewhat webbed up and it is evident that the places where they were found had been selected as hibernation quarters.

Egg.—Length 0.6 mm. Width 0.22 mm. Oblong, sides parallel, ends broadly roudned. Translucent, yellowish contents visible through chorion. Chorion apparently smooth.

In our cages 19 eggs were placed as follows: 4 on the upper leaf

surface near tip, 4 on the under surface near the side margin, 8 on the upper surface near tip, 1 on under surface near tip and 2 on the under surface near the base.

Recently Hatched Larva.—Length 2.2 mm. Width of head 0.15 mm. Uniformly white, tinged with yellow save legs, which are reddish and head which is uniformly black with mouth parts lighter. Head bears several fine long hairs. Thoracic shield brown. Each body segment bears eight fine hairs, four on dorsal surface and two on either side, two of the dorsal hairs and four of the lateral forming a transverse row. Hooks of prolegs elongate. Longitudinal lines of developing larva absent.

Full Grown Larva.—The following description is by Busck: "The larva is rather large when full grown in proportion to the imago, being 22–23 mm. long and with greatest width 2.2 mm. It is cylindrical, only slightly tapering fore and back. Head rounded, shorter than wide, black, with reddish brown vertex; width 1.3 mm. First thoracic segment somewhat narrower than the following joint, reddish, thoracic shield black, width 1.6 mm.; length 0.7 mm.; straight in front and nearly straight posteriorly. Second thoracic segment dark reddish, with anterior part white above. Third thoracic segment and the rest of the body white; on the posterior half of this joint begin six wavy, narrow interrupted longitudinal dark reddish dorsal lines, which run through on all the rest of the segments. These lines are darker in the young larvæ, which otherwise are like the full grown larvæ. Tubercles shining deep black, bearing short black hairs; they are arranged conspicuously on the white part between the dark lines. Ventral part of abdominal segments white. Thoracic feet black; abdominal prolegs normal, white, with a complete circlet of brownish hooks."

Pupa.—Length 6–7 mm. Greatest width 2 mm.

Adult.—Gelechia hibiscella. Busck's description is as follows: "Antennæ dark brown, not annulated, slightly serrate toward the tip. Labial palpi with well-developed spreading brush, yellowish white; second joint with a few black scales on the outside; terminal joint with tip and one annulation near base black.

"Face, head and thorax shining ocherous white; shoulders purplish black. Costal half of forewings dark brown, in some specimens nearly black; dorsal half including apex light ocherous brown, in

some specimens whitish. The limit between these two parts of the wing is not very definite and somewhat variable.

"In the dark costal part are found lighter, yellowish brown, irregular patches, one large indistinct at the middle of the costa, one small, rather more distinct costal spot at the beginning of the cilia and in some specimens others not well defined. In the dorsal light part of the wing are ill-defined darker shadings and the veins are indicated darker so as to produce a striate effect. On the fold at the basal one third is a small, nearly black spot which seems to be constant. Likewise is a row of black dots around the apical edge constant in all my specimens. The other markings are more or less varying.

"Hindwings a little broader than forewings, light bluish fuscous; cilia yellowish. Abdomen yellow. Legs dark purple, with yellowish white bars on the outside and with tarsal white annulations. Alar expanse 16 to 17 mm." Busck states that *hibiscella* is quite near *ochreostrigella* Chambers, but not so conspicuously streaked and with light, dark annulated third joint of labial palpi instead of the uniformly dark, nearly black terminal joint in *ochreostrigella.*

In Dyar's Catalogue (Bull. 52, U. S. N. M., 1902) the distribution of the species is given as District of Columbia. In New Jersey we have found larvæ on hibiscus at the following places: Hammonton, July 8; Gibbstown, July 2; Rutherford; Lawrence Sta., Aug. 19; Arlington, Sept. 10; in Smith's List it is recorded only from Anglesea, May 30, rare (Kf.).

So far as is known no measures of control have been worked out for this species. If it should prove troublesome in the nursery, spraying with arsenate of lead should be effective against the young larvæ before they enter the rolled leaves or feed in other concealed places. Hibernating larvæ could be destroyed by burning all dried stems, fallen leaves, etc., during the winter. At one nursery it was noted that raking up and burning the fallen leaves during the fall reduced the infestation the following spring.

Several specimens of *Idcchthis gclechiæ* Ash. (identified by R. A. Cushman through the courtesy of Dr. L. O. Howard) were bred from pupæ during the latter part of July.

Tarache (Acontia) delecta Wlk.

Acontia delecta was described by Walker in 1857 (Cat. Br. Mus., pt. xii, p. 799). In 1865 Grote described the same thing under the name *metallica* (Proc. Ent. Soc. Phil., iv, 327) from New Jersey specimens. Packard in 1870 figured the larva and pupa under this name (after Abbot) (Amer. Nat., iv, p. 229). Mr. Archibald C. Weeks in 1888 under the title "Biography of *Acontia delecta* Walker (Ent. Amer., vol. 4, p. 46) gave an account of the life history of the insect, stating that he had collected "nearly full grown larvæ during the first week of September, 1884, feeding upon *Hibiscus moscheutos.*" Beutenmüller in 1892 (Bull. Amer. Mus. Nat. Hist., iv, p. 68) also gives a brief description of the larva. The species has been noted in several lists and catalogues (Smith, Dyar, etc.), sometimes with and sometimes without reference to distribution or locality.

The strikingly colored, geometriform larvæ of this species first attracted our attention during the summer of 1917 feeding on the leaves of the rose-mallow in a nursery at Rutherford, N. J. No notes were made on its development, however, until the present year, 1918, when it was observed at various intervals during the season.

The insect is two-brooded and hibernates in the pupal stage. From these overwintering pupæ adults emerge in late May or early June, and as oviposition is undoubtedly of several days' duration, larval development is somewhat irregular. Larvæ, mostly of small size, were observed in the nursery at Rutherford on June 1 and from then until early in July, caterpillars of this brood were to be found. Second brood moths were first observed on July 8 at Arlington, N. J., and at that point and other places, throughout the rest of the month and in early August. Larvæ developing from eggs deposited by this brood of moths were first observed at Rutherford about the middle of July. Development, however, is irregular and oviposition continues for some time as larvæ could be found until early September, while some noted on August 27 were not more than half grown. These larvæ pupate in the fall and it is in this stage that the winter is passed.

The adult is a conspicuous moth, reminding one somewhat of a small *Euthisonotia unio* or *grata*.

Smith (Trans. Amer. Ent. Soc., vol. 27, p. 60) says: "This very handsome species is so much different from all its allies that recogni-

tion should be easy. When present in the field, the moths may be found resting on the hibiscus plants or on the grass near the plants. The first moths taken by us were obtained by sweeping the tall grass bordering the meadows near the patch of hibiscus at Arlington. They are not disturbed readily nor is the flight particularly rapid nor for any great distance, so that the insects may be readily captured. That they are not more abundant in collections must be due to the character and location of the food plant."

The eggs, as will be noted in the description, are somewhat globular. They are laid singly on the under surface of the leaves and do not appear to be strongly attached. Eggs laid in confinement between July 23 and July 25 hatched July 29, giving an egg period of five or six days, but the period evidently varies and in some cases is perhaps longer.

The larva is a striking one, being geometriform and characteristically marked, as noted in the description which follows. In the field larvæ may be seen usually on the upper and sometimes on the under surface of the leaves near the margins. Very commonly they will be found resting on the uppermost leaves often near the terminal bud. In feeding they make holes in the leaves somewhat like the beetle *Rhæboscelis tenuis,* but larger; also, they are sometimes responsible for devouring parts of the bracts around the buds and evidently parts of the buds. The conspicuous larva rests or feeds in this exposed situation even in the bright sunshine and it would appear that it would fall easy prey to any birds although it has been suggested that it may be protected because it perhaps resembles a fallen and twisted petal. This was not apparent to the writers, however, who found also that the larvæ were parasitized heavily in one of the patches of rose-mallow at Rutherford. Messrs. Engelhardt and Doll informed us that larvæ under their observation, at one locality, acted as if they were nocturnal feeders.

The larval period is approximately a month's duration and when the larva matures it crawls to the ground and forms a parchment-like cocoon on the surface. The pupal period of the first brood requires only a few days, while that of the second brood lasts from fall until the following June.

As previously suggested the larvæ infesting the hibiscus in one of the patches at Rutherford were found to be heavily parasitized. On

June 15 several larvæ partly developed were collected in this patch and placed in jars for the purpose of rearing adults. At the time there were no signs of parasitism, but in the course of a few days it became evident and the majority of the larvæ died. The parasite spun a characteristic parchment-like cocoon, the shrivelled remains of the larva frequently being left behind it. These cocoons were cylindrical, 5.5 mm. long and 2 mm. wide. From them parasites emerged in the course of the next few days. These were determined by Mr. Gahan through the kindness of Dr. L. O. Howard as *Sagaritas dubitatus* Cress.

On subsequent visits to this patch of mallows, parasitic cocoons were noted. Occasionally they were found on the upper surface of the leaves, but usually on the lower surface and loosely attached. Due to this latter fact many of these cocoons probably fall to the ground. One thing is evident. A large number of the larvæ in this place were parasitized, although we did not observe similar conditions in other localities. However, we did not observe larvæ so abundant in any other locality, and there is no doubt that similar parasitism may occur when the larvæ become plentiful and that this parasite may be one of the natural checks of this species.

Egg.—Diameter of base 0.5 mm. Height 0.55 mm. Subglobular, slightly broader at base. Chorion sculptured with pronounced, acute, blade-like ridges running from base toward apex and with a number of fine transverse lines. About one-half of the twenty-four ridges extend almost to micropyle and a few unite in pairs, the other half extending about two thirds of the way up. Color light. Deposited singly on under side of leaf, not strongly attached.

Recently Hatched Larva.—Length 2 mm. Width of head 0.75 mm. Head uniform, mahogany brown, decidedly broader than any other body segment. General color dirty white, with the body segments especially the first six, tending to be banded with brown. The points which become black dots in the mature larva are more or less tuberculate and bear fine, long hairs. Claws of prolegs elongate and well developed, being as long as proleg itself.

Full Grown Larva.—Length 34–36 mm. Width of head 2.5–3 mm. The following description is by Weeks: "Head and first segment smaller than remainder of body. Head rounded, somewhat flattened on the sides, broader at bottom than at top, strongly cleft at

summit, ground color dirty white, mouth parts black; ground color enclosing a triangular black space in front; bottom, middle and summit of eyes with black spots, sometimes confluent; eyes with exceedingly minute sparse hairs. Body cylindrical, considerably enlarged anteriorly on the third and fourth segments. Ground color dark purple. On all segments a subdorsal line of black spots, strongly edged with orange, especially on the middle segments. On the third and fourth segments, directly below the first subdorsal line, appears a second double line of black spots in pairs, each pair joined and included by an oval orange patch. On each of the other segments are two other spots directly behind the first subdorsal. These are edged with orange, especially in front and more conspicuously on the middle segments. The black spots, especially at the middle segments have a slight tuberculous tendency and from each of them a single, short minute black hair projects, barely visible to the naked eye. There is also a row of sublateral patches, white anteriorly, orange posteriorly, broadest behind and narrowing toward the front, each patch containing from three to seven irregularly located and varying velvety black dots. The first and second pair of anal legs are wanting. The larva is consequently geometriform and has the geometriform mode of progression. The fore legs are black, with whitish orange towards the base. Anal legs orange on the outside, their color being confluent with the lateral patch except in last pair. Anal legs somewhat projecting behind. A cluster of five or six minute hairs projects horizontally and directly above and between the anal claws. The rows of subventral black dots nearly correspond as to position with the subdorsal but want color; from each dot, hairs similar to subdorsal project."

Pupa.—Length 10 mm. Width 4 mm. Color uniformly reddish brown.

Cocoon.—Length 15 mm. Width 10 mm. Oval, thin, parchment-like covering with particles of soil or other foreign matter attached to outer surface.

This species is found along the Atlantic Coast. Smith (Trans. Am. Ent. Soc., vol. 27, p. 60) gives the distribution, "New York and southward to Florida and Texas, not common." The local records which we have obtained are as follows: Rye (J. A.); New York and vicinity (Elliot Coll.); Long Island (Shoemaker, Doll); Great Kill,

S. I. (W. T. Davis; New York. Elizabeth, around edge of salt meadow, larva June and August, adults May 20, June 5, July 5–20, August 20, October 1 (Buchholz); (the latter record is hard to account for); Little Ferry, August 19 (Wormsbacher); Stone Harbor, August 12 larva, May 16 adult (Daeke); Cape May (Laurent); Newark and Arlington, first brood of moths, end of May and beginning of June, second brood July and August (Rummel). Our own records are Rutherford (nursery); Arlington (meadow and nursery); Atlantic Highlands (meadow); Eatontown (nursery); New Jersey.

At the few places where the insect was noted in nurseries it was not abundant enough to require remedial measures. Should such measures be necessary, however, the insect could undoubtedly be controlled by spraying with arsenate of lead. As it passes the winter in the cocoon, clean culture would probably destroy many of them. This is what appears to have happened in a nursery block at Rutherford, where the insects were noted in 1917. The fallen leaves, etc., about the plants were raked up and destroyed and as a result very few larvæ noted the following season.

Papaipema nitela Gn.

During the early summer, the injury of this insect was observed in a field patch of the swamp rose-mallow at Rutherford, N. J. The infested shoots were not abundant, but here and there one could be detected by the wilted condition of the leaves and tips.

This insect and its life history are too well known to need much comment here. It is distributed throughout New Jersey and is sometimes common. According to Smith (Insects of New Jersey, 1909) its normal food plant is ragweed (*Ambrosia trifida*), but it is a general feeder and may also infest dock and a number of other plants, including when abundant such cultivated plants as tomato, potato, corn, etc.

The eggs are deposited in the fall; the larva bores in the stem; may infest several in succession, especially if they are small: pupates in the stem. In New Jersey adults occur from late July to September.

Cultivated plants are especially liable to attack if there are numerous weeds growing in the vicinity and this was just the case in the infested hibiscus plots at Rutherford, where there were not only

many weeds around the patches, but some in them as well. Under ordinary conditions where the rose-mallow is grown as an ornamental, it is doubtful if the plants would very often become infested.

OTHER LEPIDOPTERA.

Two or three different times during the summer single, slender, rather prettily marked geometrid larvæ were found feeding on the blossoms of the swamp rose-mallow. One of these was bred to maturity and proved to be a species of *Eupithecia*.

OTHER INSECTS INFESTING THE STEMS AND LEAVES.

Neolasioptera hibisci Felt.

This cecidomyid was described by Felt in 1907 (N. Y. State Mus. Bull., 110, 155–6) under the generic name *Choristoneura*. Dr. Felt stated that it was bred April 25, 1907, from slightly enlarged stems of the rose marsh-mallow (*Hibiscus moscheutos*) taken on Staten Island, N. Y. (Type Cecid. a 1410, N. Y. State Mus.) He again mentions this species in his reports for 1907 (N. Y. State Mus. Bull., 124, p. 320 and 333) and 1916 (N. Y. State Mus. Bull., 198, p. 196), and in the latter describes the gall and larva as well as again giving descriptions of the male and female and figuring burrows in the stem.

The gall of this species is an abnormal thickening of the stem of the hibuscus. Concerning it, Felt says: "Infested stems can usually be discovered by a somewhat abnormal thickening, though occasionally a badly infested stem may be nearly twice the usual size. The female appears to deposit eggs in a small slit in the stem, the larva usually tunneling the pith and frequently excavating a channel just beneath the surface. The larvæ occur singly or in numbers in the pith and occasionally in the outer portions of the tissues. One stalk may be infested by only a few larvæ or may contain 50 to 100 or more."

These galls were first noted by us in August, 1917, in a bed of hibiscus seedlings in a nursery at Rutherford. The plants varied from six to fifteen inches in height and several of them showed the gall-like swellings which contained larvæ and a few pupæ. Adults emerged from these later in the month. Later, during 1917 and several times during the present year 1918, these galls have been

observed on more mature stems. The galls vary from one and one half to four inches in length and sometimes there is scarcely a trace of the swelling. Most of the larvæ have been in the swollen part of the gall, but sometimes a few have been found in the stem above the swollen part.

A number of galls have been examined, and while we have found a number of larvæ in some, we have never found as many as Dr. Felt suggests may occur, although their number varies. On October 27, 1918, seventeen galls were collected and examined; eight contained nothing while exit holes were noted on the outside of the galls. The remaining nine contained larvæ as follows: 2, 7, 3, 5, 10, 8, 4, 17. It is evident that the insect hibernates in the gall and emerges in the spring. This accounts for the April records. Our own specimens both seasons emerged in August, but whether the insects occur in broods we are unable to say.

The description of the larva is given by Felt as follows: "Length 4 mm., rather stout, light yellowish. Head small, antennæ uniarticulate, slender, tapering; breast bone stout, somewhat expanded apically, bidentate and with a rudimentary median tooth; skin finely shagreened; posterior extremity broadly rounded." It will not be necessary to give the descriptions of the adults.

It is sufficient to note that this cecidomyid is a rather pretty species, being dark brown in color with lighter markings of golden yellow and silvery white; posterior tarsi with second to fourth segments banded at both extremities and antennal segments of male are 15 to 16, while those of the female number 23.

Our records of distribution are Staten Island, N. Y. (Felt); Rutherford, Arlington, Atlantic Highlands and Palmyra, N. J. The gall does not seem to be particularly injurious to the plant.

Plant Lice.

Plant lice were observed on the hibiscus plants, both in the nursery at Rutherford and the marsh at Arlington early in July. A few days later they were noted on plants in the marsh at Ridgefield and at one or two other points later in the season. At Rutherford they continued on the plants throughout the season and on October 24, after the temperature had been low enough to effect many of the

leaves, several of the latter least affected were found to be infested with both winged and wingless forms. They of course were inactive due to the low temperature.

The infestation in the nursery was somewhat scattered, and while some leaves were badly infested, the resulting injury was not very apparent, as infestation could usually only be determined by examining the under surface of the foliage. Parasitism was in evidence, but not sufficient to materially check the development and continuation of the species throughout the summer. The parasite bred from the aphids was determined by Mr. Gahan through the courtesy of Dr. L. O. Howard as a species of *Aphidius*.

The plant lice noted in the several localities were evidently all of one species which was identified by Prof. C. P. Gillette as *Aphis gossypii* Glover. According to Dr. Patch (Food Plant Cat. of Aphididæ of World, Maine Agric. Exp. Sta. Bull. 270) there are three other species infesting species of *Hibisci, Apris Malvæ* Walker, *A. medicaginis* Koch and *Rhopalosiphum dianthi* Schr.

Leaf Hoppers.

On nursery plants of hibiscus both at Rutherford and South Orange, adults and nymphs were observed infesting the lower surfaces of the leaves. They were not abundant, but judging from the fact that some of the nymphs were very young, it was quite evident that oviposition and development occurred on the plants. Infestations occurred throughout the season and as late as October 24 both nymphs were to be found on some of the leaves at Rutherford. Specimens were kindly identified by Dr. Ball, who stated that the species was *Empoasca mali* LeB., and wrote as follows: "The specimens you sent were unquestionably those of *Empoasca mali* LeB., the commonly known 'apple leaf-hopper,' which I am going to rechristen 'the potato leaf-hopper.' This species was seriously abundant on potatoes throughout the northern section, from Montana east this season. It also attacks nursery stock and water sprouts of apple trees, but not the older and more slowly growing leaves of the apple. This species hibernates as an adult, so far as I have been able to determine, while *Empoasca unicolor,* which is the real apple leaf-hopper, deposits its eggs in the apple twigs and spends its whole

life—a single generation a year—on the apple tree. This is the real apple leaf-hopper, but in most of the work on that so-called species these two and *rosæ* have been mixed."

Aleyrodidæ.

In August, specimens of "white fly," both adults and nymphs, were observed an *Hibiscus moscheutos* in one of the nursery blocks at Rutherford. The specimens were few in number and the species was not determined. The infestation, however, may have been incidental.

Coccinellidæ.

Both larvæ and adults of a few species of *Coccinellidæ* were observed on the plants at Rutherford. They were evidently feeding on the plant lice and adults of the following were collected, *Hippodamia 13-punctata* L., *H. convergens* Guer., *Coccinella 9-notata* Hbst., and *Adalia bipunctata* L.

Cambium miner.

At Atlantic Highlands, N. J., and Rutherford, N. J., what appeared to be the work of a cambium miner was observed on the stems. No specimens were found and the identity of the species is unknown to us.

Erastria amaturaria Walk.

A loosely folded hibiscus leaf containing a pupa was noted at Rutherford on August 10. The adult which emerged proved to be this species. The species is recorded as common and the larva is said to feed on *Polygonum dumetorum,* so that the occurrence on hibiscus may be accidental.

Scudderia texensis S. & P.

A visit to Arlington soon after the flower buds became well developed revealed the fact that a number of them had been partially eaten. Closer observation showed that the injury was caused by a species of Locustidæ identified by Mr. W. T. Davis as *Scudderia texensis.* Two specimens of this species were captured while feeding on the buds. Other species of Locustidæ and Acrididæ were also present in the area where the mallows were growing, so that some of them may have been responsible also for a part of this injury.

INSECTS IN THE DRIED STEMS.

On several occasions during the fall indications of insect activity have been observed in the dried hibiscus stems remaining in the field. In quite a few instances dead stems had the pith removed and the channel divided off into cells. These cells contained dried pupal shells, evidently those of a hymenopteron. In another instance, we found somewhat similar cells in the pith packed with plant lice, which had evidently been stored there by a species of Pemphredonidæ.

INSECTS FOUND IN BLOSSOMS.

COLEOPTERA.

Conotelus obscurus Er.

Common in various places where flowers were examined. This species is widely distributed and common in *Convolvulus* and other flowers.

Chauliognathus pennsylvanicus DeG.

Found in hibiscus flower at South Amboy, N. J., August 15. Common, also found in golden rod, wild carrot, etc.

Diabrotica 12-punctata Oliv.

In all localities in hibiscus blossoms. This species is common on many plants; larva injures roots of corn and grasses.

Bruchus discoideus Say.

Westville, August, one specimen.

Mordella octopunctata Fab.

Aqueduct, Long Island, N. Y., viii, 1918; collected on blossom (Geo. P. Engelhardt).

HEMIPTERA.

Triphleps insidiosus Say.

Found in nearly all localities where flowers were examined. This common parasitic hemipteron is found in various blossoms.

HYMENOPTERA.

Agapostemon virescens Fab.

Atlantic Highlands, August 15.

Agapostemon splendens Lep.

Lawrence Station, August 19; Riverton, August 16.

Melissodes sp.

Riverton, August 16; South Orange, August 12.

Melissodes bimaculata Lep.

Eatontown, August 20; South Orange, August 12; Springfield, August 3.

Xenoglossa pruinosa Say.

Springfield, August 3; South Orange, August 12; visits flowers of cucurbits by preference.

Emphor bombiformis Cress. var. **albojulatus** Ckll.

In several localities where flowers were examined. The life history of this species was worked on by the late Mr. J. A. Grossbeck, who found that the hibiscus pollen gathered served as food for the larvæ.

Clisodon terminalis Cress.

Rutherford, August 16.

Bombus fervidus Fab.
Bombus impatiens Harr.
Bombus bimaculatus Cress.
Bombus auricomus Rob.

Diptera.

Specimens of a cecidomyid submitted to Dr. Felt, were in the absence of males identified as probably one of the Diplosids.

Insects Found in Developing Folded Leaves.

Two species of *Coleoptera,* namely, *Aphrastus taeniatus* Gyll, and *Gymnetron tetrum* Fab., were quite common at Rutherford during the second and third week of July, in the developing folded leaves at the tips of the shoots. No feeding could be detected.

Acknowledgments.

It is a pleasure to acknowledge our indebtedness to Mr. C. W. Leng, who aided us considerably by identifications and references to the literature, and to Dr. L. O. Howard and the specialists named in the text, Dr. E. P. Felt, Dr. F. E. Lutz, Mr. C. A. Frost, Mr. W. T. Davis, Dr. J. Bequaert, Prof. H. C. Fall, Mr. H. Hornig, Mr. Frank Watson, and Mr. G. M. Greene for records, identifications and other

help. To Mr. Erdman West and Mr. Breeder our thanks are due for the photographs.

EXPLANATION OF PLATES X, XI, XII.

Fig. 1. A nursery patch of *Hibiscus moscheutos* during the winter.
Fig. 2. *Acontia delecta* adult.
Fig. 3. *Acontia delecta* with wings folded.
Fig. 4. *Gelechia hibiscella* adult.
Fig. 5. Larvæ of *Acontia delecta.*
Fig. 6. Petioles injured by larvæ of *Rhœboscelis tenuis.*
Fig. 7. Work of larvæ of *R. tenuis* in hibiscus stems, showing larva in one of the left.
Fig. 8. Cocoon of *Sagaritas dubitatus* with shrivelled larval skin attached.
Fig. 9. Work of larva of *Papaipema nitela.*
Fig. 10. Feeding (large holes) of *Rhœboscelis tenuis.*
Figs. 11 and 12. Galls of *Apion hibisci.*
Fig. 13. Stem split to show cavity occupied by larva of *Apion hibisci.*
Fig. 14. Gall of *Neolasioptera hibisci.*
Fig. 15. Stem split to show cavity in pith occupied by larvæ of *Neolasioptera hibisci.*
Fig. 16. Feeding of *Chætocnema quadricollis.*
Fig. 17. Flower buds injured by *Scudderia texensis.*
Fig. 18. Leaf cut and rolled by larva of *Gelechia hibiscella.*

CICADAS OF THE GENUS CACAMA, WITH DESCRIPTIONS OF SEVERAL NEW SPECIES.

BY WM. T. DAVIS,

NEW BRIGHTON, STATEN ISLAND, N. Y.

In Genera Insectorum Mr. Distant lists *Cacama maura* Dist. from Mexico and Yucatan; and both *Cacama dissimilis* Dist. and *Cacama longirostris* Dist. from Mexico. These three species were described in 1881 in Biol. Centr.-Amer., *maura* and *longirostris* under the generic name of *Proarna,* and *dissimilis* as a *Cicada.* Uhler's *Proarna valvata* described from Texas and Arizona in 1888 in Entomologica Americana, is listed in that genus in Genera Insectorum, but Mr. Van Duzee removed it to the genus *Cacama* in 1915 (JOURNAL N. Y. ENTO. SOCIETY). In the Transactions of the San Diego